

California Energy Commission

Non-Petroleum Fuel Working Groups
October 12, 2004



Trucking Industry Already Facing Many Challenges

- Oct. 2004 – Record Breaking Diesel Fuel Prices
- Oct. 4th – On-Road Diesel \$2.236 Per Gallon
- (LNG ~ \$1.50 Per DGE)
- Oct. 8th – Oil Reaches \$53/Barrel
- 2004 HD Engines – Advanced Technology
 - Increase Life Cycle Costs ~ \$20,000
- Upcoming Regulations and Tomorrow's Technologies are Complicated

Additional Pressures in The Near Future

- March 2005- Shell Bakersfield Plant To Close (6% CA Diesel Production)
- 2006 ULSD Standards – CA aromatic requirements still requires unique fuel blend
- 2007 and 2010 – HD Engine Standards
 - Increased Technologies Required

Questions for the Diesel Industry

1. What will Diesel Fuel Cost in 2007, 2010 and Beyond?
2. What will HD Engines/Trucks Cost in 2007, 2010 and Beyond?
3. Are There More Cost-Effective Alternatives?

Answers for the Diesel Industry

1. What will Diesel Fuel Cost in 2007, 2010 and Beyond?

➤ Largely Uncertain, but likely A LOT MORE!!!

Answers for the Diesel Industry

2. What will HD Engines/Trucks Cost in 2007, 2010 and Beyond?

- A LOT!!!
- Life-Cycle Increases Estimated from \$31,300 to \$42,300 Per Truck
- Many Remaining Technology Unknowns & Uncertainties

Answers for the Diesel Industry

3. Are There More Cost-Effective Alternatives?

- YES!!!
- Natural Gas Has A Great Start
- Cummins Engine Company: “At the same production levels, NG engines will cost significantly less than diesels meeting 2010 NOx emission levels.”
- Fuel is Likely to Cost Less As Well

Existing HD LNG Market

	<u>Total US</u>	<u>CA</u>
Existing Projects	65	51
No. LNG Vehicles	2,411	1,614
No. LNG Stations	49	35
New LNGVs (1-2 yrs)	1,171	726
New Stations (1-2 yr)	19	18

LNG for HDVs - Supply Points



HD LNG Demand

US (not incl. CA)

California

Existing GPD

68,000

100,000

Existing GPY

24,820,000

36,500,000

Growth GPD

36,000

40,000

Growth GPY

13,140,000

14,600,000

Challenges for the HD Natural Gas Vehicle Industry

1. Air Quality Drivers Not What they Used to Be.
2. “More Stable, Domestic, Cleaner” Arguments Can No Longer Be Made.
3. Market Not Growing Fast Enough to Encourage OEMs.
4. Market Not Yet Sustainable.
5. LNG Production Must Keep Pace.

Opportunities for the HD Natural Gas Vehicle Industry


1. If You're Looking at Displacement, HD and NG Are Good Places To Start.
2. Diesels Not Getting Cheaper.
3. Push For H2 Provides Renewed Interest in Gaseous Fuels For Transportation.
4. Local Small-Scale LNG Production On the Rise
5. Import Terminals May Provide VERY Cost-Effective Fuel...And Lots of It!

The REAL Question Is: *HOW DO WE GET THERE?*

- A Long-Term Sustainable Market **MUST MAKE ECONOMIC SENSE.**
 - Cannot be based upon government subsidies, grants, or other traditional incentives.
 - Regulation not likely to create a sustainable market.
- A Sustainable Market Must Be Good for the Corporate Bottom Line.

Current Market: LNG v. Diesel


Common California Line-Haul Truck



75,000	Avg. mileage per year
12,500	Avg. diesel fuel use per year (diesel gallons)
\$2.24	Avg. CA diesel cost (Oct. 2004)
\$0.85	Avg. CA LNG cost (Oct. 2004)
2 to 1	LNG to diesel conversion ratio
21,250	Equiv. LNG fuel use per year (LNG gallons)
\$28,000	Avg. diesel fuel cost per year
\$21,250	Equiv. LNG fuel cost per year
\$6,750	Difference per year
7	Avg. life for a CA truck before resale
\$47,250	Fuel Cost Savings Over Life of Truck

Potential Market: LNG v. Diesel

Common California Line-Haul Truck



75,000	Avg. mileage per year
12,500	Avg. diesel fuel use per year (diesel gallons)
\$2.24	Avg. CA diesel cost (Using Oct. 2004 pricing)
\$0.50	Potential CA LNG cost (using local sources)
2 to 1	LNG to diesel conversion ratio
21,250	Equiv. LNG fuel use per year (LNG gallons)
\$28,000	Avg. diesel fuel cost per year
\$12,500	Equiv. LNG fuel cost per year
\$15,500	Difference per year

7 Avg. life for a CA truck before resale

\$108,500 Fuel Cost Savings Over Life of Truck

Long Term Sustainability

- If We Can Demonstrate Such Fuel Cost Savings, the Rest of the Market Will Drive Itself.
 - End-User Purchasing Power Will Push Necessary Investments in Infrastructure, Vehicle and Engine R&D, and Overall Product Availability.
 - How Do We Demonstrate Such Fuel Cost Savings?
- ➔ In-State Liquefaction Using In-State Resources.

Estimated CA Resources for NG

<u>Source</u>	<u>Prod. Capacity (GPD)</u>
Landfill Gas	5.0 Million
Stranded Gas	1.0 Million
Digester Gas	1.0 Million
<hr/> TOTAL	<hr/> 7.0 Million
Today's Demand	100,000 GPD

Potential Diesel Displacement Using CA Produced LNG

7,000,000 **Potential In-State LNG Production / Day**

4,117,647 **Equiv. Diesel Gallons / Day**

1,502,941,176 **Equiv. Diesel Gallons Displaced / Year**

120,235 **No. of Diesel Trucks Using LNG
(under this potential scenario)**

Potential Diesel Displacement Using CA Produced LNG

2,784,014,195 Existing Annual CA Diesel Consumption

1,502,941,176 Potential CA Displacement with LNG

54% Displacement Percent

Liquefaction Investment Required: \$700 MM

(Assumes \$2.5 MM per 25,000 GPD of Liquefaction)

Potential Benefits of Using CA LNG for Diesel Displacement

1. Tremendous Opportunity for Displacement
2. Utilize Growing Fueling Infrastructure Base
3. Existing, Under-Utilized Domestic Fuel Source
4. Reduce GHG Emissions
5. Produce Low-Cost Fuel Source for Fleets
6. Small-Scale/Local Liquefaction Yields a Diverse Supply Base
7. Complements H2 Infrastructure Development

Recommendations

1. Analyze Actual Available Gas Volumes
2. Assess Competing Uses For Gas As Demand/Cost Increases
3. Determine Actual State-Wide Potential for LNG Production From These Sources
4. Determine Status of Liquefaction Technology and Additional Investment Needed
5. Determine Price of LNG Produced From These Sources
6. Compare Against Future Diesel Projections
7. Assess Further Policy Options